Name: _____ Student ID: _____

General Biology Laboratory Exercise

Laboratory Exercise 5:
Osmosis & Cell Structure

1. **Osmosis**. A *solution* is a homogeneous mixture in which a substance, the **solute**, is dissolved in a fluid, the **solvent**. The particles of the solute are of molecular or ionic size within the solution. Review section 5.6 – 5.7 of your text. In general, substances tend to move from areas of higher concentration to areas of lower concentration, a process called **diffusion**.

   Membranes will often limit diffusion, because they allow only certain substances to cross, thus they are *semipermeable*. If you place aqueous solutions on either side of a membrane with solutes that cannot pass through the membrane, the diffusion of water, or _____ ____ will occur. Water tends to move from areas of low *solute* concentration to areas of high solute concentration. Cells are susceptible to osmosis. If you place a cell in a solution higher in solutes (a _____ solution) than inside the cell, the cell will shrink. If you place a cell in a solution lower in solutes (a _____ ___ solution), the cell will swell. If you place a cell in a solution with the same concentration of solutes (an _____ solution), the cell will neither shrink nor swell.

   a. What would happen to a blood cell if it were placed in distilled water? _____ _____ _____

   b. Plant cells have structures external to the plasma membrane, called _____ ____ which limit the amount of water that can diffuse into the cell by osmosis. In hypotonic solutions, plants will exhibit **turgor**, becoming firm. In hypertonic solutions, plants will wilt due to the plasma membrane pulling away from the cell wall, a process called **plasmolysis**.

   c. **Osmosis Experiment**. We will mimic a cell membrane by using dialysis tubing, closing either end with clips. We will place different solutions inside and outside each membrane, noting the change in the amount of solution inside the membrane.

      i. Obtain one section of dialysis tubing per group. Clip one end tightly with one of the clips provided.

      ii. Measure 10 mL of your group's assigned solution for inside the membrane. Open the free end of your dialysis tubing. Pour in the 10 mL. Carefully force out excess air by squeezing the bottom of the tubing. Fold and clip the free end.

      iii. Wet your tube in dH_2O, blot dry, and weigh on the scale. Record your starting weight on the table below.

      iv. Fill a beaker with 200 mL of your group's assigned solution for outside the membrane. Place your tube in the beaker. Record the time.

v. Blot and weigh your tube after 45 minutes. Record the weight.

vi. Blot and weigh your tube after 90 minutes. Record the weight.

vii. Every student **must** produce a **line graph** of the *change in weight* at different concentrations of solution for the entire class. **This graph must be computer generated and properly labeled.** Be sure to label your x-axis (*time in minutes*), y-axis (*change in weight in grams*), and the data lines for each group. **Type** a short paragraph explaining the results. This paragraph should include the following:

1. Identify independent vs. dependent variables

2. A discussion of tonicity and osmosis. Include specific examples from the data you collected

viii. The graph with its paragraph explanation will be due at the beginning of the next class period.

Data for Osmosis Experiment

	Concentration of solution			Weight (g)			Change in weight (g) from time zero		
Group	Tube	Beaker	Start Time	0 min.	45 min.	90 min.	Δ at 0 min.	Δ at 45 min.	Δ at 90 min.
1									
2									
3									
4									
5									
6									
7									
8									

Cell Structure. You now have the opportunity to examine cell structure. You will be observing two of the three basic domains, which will include bacteria cells, protists cells, animal and plant cells.

1. Bacteria. You are looking at an Endospore stain prepared slide of Bacillus. The green area represents the spore and the pink represents the vegetative (live) part of the cell. These bacteria are capable of creating spores which preserve the bacteria during harsh times. The spores can be dormant in the soil for many years. This is a gram positive bacteria which causes diseases such as anthrax (pulmonary and cutaneous), tetanus, botulism, and gas gangrene. Draw one or two bacteria and label the spore and vegetative parts. Answer the following questions:

    a. Is this a prokaryotic or eukaryotic cell? _____

    b. Is this multicelled or single celled? _____

    c. Is this autotrophic or heterotrophic? _____

    d. Does this organism have a cell wall? _____

    e. How does this organism move? _____

Bacillus

Magnification _____

2. Bacteria. Prepare a wet mount of oscillitoria. This is a common bacterium found in ponds and fresh water systems. This bacterium grows in filamentous colonies. Draw three to four individual cells which are part of the same filament.

    a. Is this a prokaryotic or eukaryotic cell? _____

    b. Is this multicelled or single celled? _____

    c. Is this autotrophic or heterotrophic? _____

    d. Does this organism have a cell wall? _____